

Innovation Center Smart Light for Enhancing Creativity

Completed Technology Project (2013 - 2014)



Project Introduction

Recent literature has documented that exposure to different types of light affect circadian rhythms, problem solving ability and creativity. Based upon these findings, NASA has been exploring different types of lighting for astronaut health well-being and function. In this project, a set of large floor "smart-lamps" will be designed and constructed so that illumination can be adjusted, depending upon the need. Unlike conventional lamps, these lamps will have color-changing Light Emitting Diodes (LEDs), and the colors will be controlled by input from a smartphone. These lights will be deployed and evaluated in the NASA SSC Innovation Center. Additionally, an efficient diffuser will be used to eliminate the point source emissions of LED light sources and produce a pleasant diffuse illumination. A novel light controllable "smart-lamp" will have utility in a multitude of studies that look at the effects illumination has upon human productivity.

The purpose of this project is to develop a spectrally adaptable floor-stand smart-lamp. Intelligently mixing different narrow band color light sources can produce a wide range of light quality which can affect human performance. This smart-lamp will be designed and constructed so that illumination can be adjusted, depending on the need. Discrete color Light Emitting Diodes (LEDs) will be used as the light source, and illumination and individual color brightness will be controlled by a micro-computing device that will have the capability to adjust light levels based upon the need. An efficient diffuser will be used to eliminate the point source emissions of the LED light sources, mix the individual colors and produce pleasant diffuse illumination.

Anticipated Benefits

The smart lighting technology will directly benefit NASA funded mission by addressing issues related to astronaut insomnia, which has been a perennial problem on International Space Station. Lack of sleep impairs motor function and critical thinking skills. A "smart-lamp" light source could be used to perform lighting studies and enable NASA to understand impact variable lighting has, and maximize benefits of deliberately chosen lighting conditions.

The "smart lighting technology insert technology" will benefit NASA unfunded mission and planned missions by enabling enhancements to the light environment to optimize inter-relationship between work and productivity.

Benefits to the commercial space industry would be comparable to those anticipated for NASA, and could provide enhancements to the light environment to optimize inter-relationship between work environment and human health and performance.

Similarly, benefits to all other government agencies include enhancements to the light environment to optimize inter-relationship between work



Illumination Prior to Mixing

Table of Contents

| | |
|--|---|
| Project Introduction | 1 |
| Anticipated Benefits | 1 |
| Organizational Responsibility | 1 |
| Primary U.S. Work Locations and Key Partners | 2 |
| Project Management | 2 |
| Technology Maturity (TRL) | 2 |
| Technology Areas | 2 |
| Images | 3 |

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Stennis Space Center (SSC)

Responsible Program:

Center Innovation Fund: SSC CIF

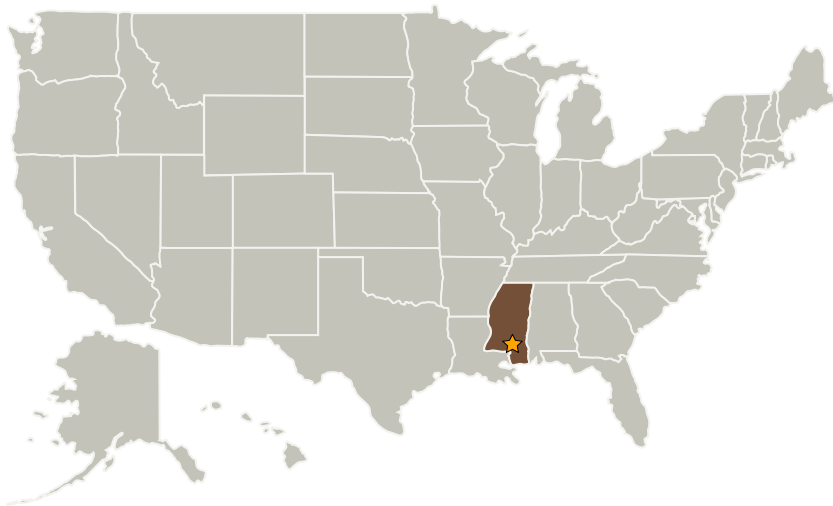
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environment and human health and performance.

Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|-------------------------|--|-----------------------------------|
| ★ Stennis Space Center(SSC) | Lead Organization | NASA Center | Stennis Space Center, Mississippi |
| Innovative Imaging and Research Corporation | Supporting Organization | Industry Women-Owned Small Business (WOSB) | Stennis Space Center, Mississippi |

Primary U.S. Work Locations

Mississippi

Project Management

Program Director:

Michael R Lapointe

Program Manager:

Ramona E Travis

Project Manager:

Lauren W Underwood

Principal Investigator:

Lauren W Underwood

Co-Investigator:

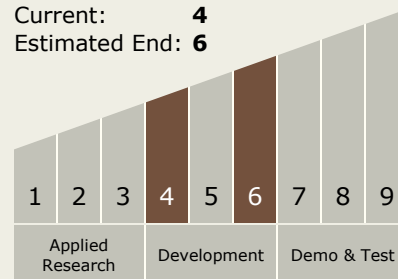
Robert Ryan

Technology Maturity (TRL)

Start: 4

Current: 4

Estimated End: 6



Technology Areas

Primary:

- TX06 Human Health, Life Support, and Habitation Systems
 - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems

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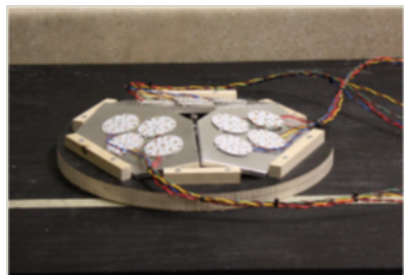
Images



Illumination Prior to Mixing

Illumination Prior to Mixing

(<https://techport.nasa.gov/image/2777>)



Smart Lamp LED Configuration

Smart Lamp LED Configuration

(<https://techport.nasa.gov/image/2776>)

Technology Areas (cont.)

- └ TX06.1.4 Habitation Systems